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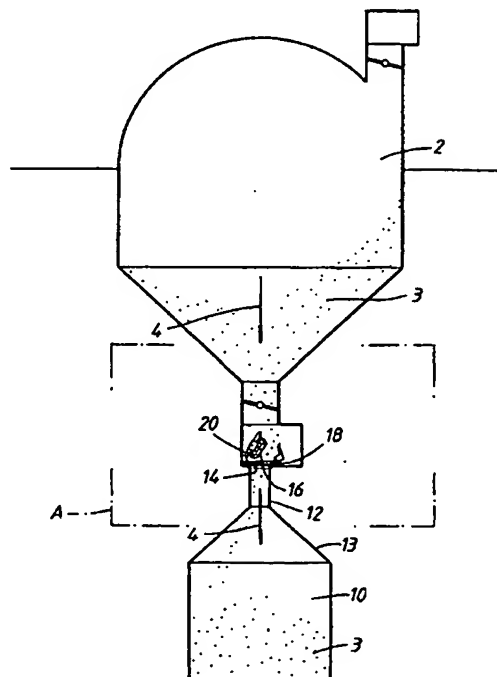
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(21) International Application Number: PCT/GB93/02577 (22) International Filing Date: 17 December 1993 (17.12.93) (30) Priority Data: 9300091.7 5 January 1993 (05.01.93) GB (71) Applicant (for all designated States except US): TOTAL PROCESS CONTAINMENT LIMITED [GB/GB]; Tanshire House, Shackleford Road, Elstead, Surrey GU8 6LB (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): SMITH, David, Trevor [GB/GB]; Rudwicks, Rudwicks Close, Felpham, Bognor Regis, West Sussex PO22 7NG (GB). WILKINS, Julian, James [GB/GB]; River House, The Loke, Great Snoring, Near Fakenham NR21 0HQ (GB). McDONALD, Austin, Patrick [IE/GB]; Total Process Containment Limited, Tanshire House, Shackleford Road, Elstead, Surrey GU8 6LB (GB). (74) Agent: SILVERMAN, Warren; Haseltine Lake & Co., Hazlitt House, 28 Southampton Buildings, Chancery Lane, London WC2A 1AT (GB).			(81) Designated States: AU, CA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report.

(54) Title: PROCESS MATERIAL TRANSFER

(57) Abstract

Transport of contents of a vessel (2) such as a production vessel or storage vessel to a handling location without exposing the contents to the environment in a preferably disposable transport container (10) having an inlet port (14) provided with a second door (16). The contents are released to the transport containers through an outlet port (18) having a first door (20) and which is located on the vessel. By rotational engagement, the respective ports (14, 18) are couplable on the one hand and the respective doors (16, 20) are couplable on the other hand so that when the ports are coupled and the doors are coupled, the coupled door combination can be displaced to permit communication between transport container (10) and vessel (2). The surfaces of the doors which in the uncoupled state of the transport container and the vessel are exposed to the environment are sealingly engaged together to prevent ingress of material therebetween. When transfer of contents of the vessel into the transport container (10) is to be terminated, communication between the transport container (10) and the vessel (2) is closed off and the doors (16, 20) are disengaged to leave the ports closed by respective doors.



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Process Material Transfer

This invention relates to the handling of process material and more particularly to the handling of process waste and to a waste handling system for use therein.

It is good manufacturing practice and also frequently a product licensing requirement that there be a predetermined standard applied to the cleaning down of powdered material processing areas, process equipment and associated transport containers in the pharmaceutical industry. These general requirements also govern the use of controlled environments for example clean rooms where powdered materials are handled and processed. Carried out in these controlled environments often are processes which involve regular discharging from and charging into process equipment of powdered material and transport of powdered material between process equipment. These activities tend to cause widespread unwanted contamination of a controlled environment and containers used in the transport. The process equipment and transport containers which form a part of the manufacturing process are generally unavoidably contaminated internally and externally during such handling operations.

When a controlled environment is to be used for a new powder material process following its use in another powder material process, the controlled environment has to be totally cleaned for compliance with good manufacturing practice and licensing requirements, in particular to avoid cross contamination which could be injurious to and end consumer. Cleaning to avoid cross contamination often takes long periods of time during which the use of an expensive controlled environment is denied. Copious quantities of solid and aqueous contaminated process

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waste are generated during such cleaning. Unless this solid and aqueous process waste is adequately treated using expensive processes, it can be harmful to the environment.

5        It is an object of this invention to provide a method and equipment for controlling the discharge, transport and charging of the contents of a production or storage vessel which avoids contamination of a controlled environment and in so doing minimises the  
10 amount of equipment requiring cleaning or decontamination after such handling has taken place.

According to a first aspect of the invention, there is provided a method of transporting contents of a vessel, such as a production vessel or storage  
15 vessel, to a handling location without exposing the contents to the environment, which comprises providing on the vessel an outlet port having a first door and bringing up to the port a transport container for collecting material from said vessel and having an  
20 inlet port provided with a second door, coupling the respective ports on the one hand and the respective doors on the other hand and displacing the coupled door combination thus produced so as to permit communication between transport container and said vessel and  
25 transferring said contents to the transport container, the surfaces of the doors which in the uncoupled state of the transport container and said vessel are exposed to the environment being sealingly engaged together to prevent ingress of material therebetween, and when  
30 transfer of contents into the transport container is to be terminated, closing off communication between said transport container and said vessel while at the same time disengaging said doors so as to leave the said ports closed by the respective said doors.

35        According to a second aspect of the invention there is provided the combination of an outlet port

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attached or for attachment to a wall surface of a vessel, such as a production vessel or a storage vessel, and a transport container having an inlet port for engagement with said outlet port, a door comprised  
5 by each said port, first coupling means for coupling said ports and second coupling means for coupling said doors when there is coupling of the ports to form a combined door, means for displacing the combined door, when said ports are coupled, to communicate the  
10 upstream side of one port with the downstream side of the other port, and sealing means on said doors to prevent ingress of material therebetween, which ports are closable by the respective doors thereof on uncoupling said doors and uncoupling said ports.

15 For a better understanding of the invention and to show how the same can be carried into effect reference will be now be made by way of example only to the accompanying drawings wherein:-

Figure 1 shows schematically a system for the  
20 discharge of powder material from a production vessel into a disposable transport container;

Figure 2 shows part A of the system of Figure 1 to an enlarged scale;

Figure 3a shows in sectional exploded view and in  
25 greater detail the components of the docking arrangement for docking transport container to production vessel.

Figure 3b' shows the disposition of the components of the docking arrangement when communication between  
30 transport container and production vessel is closed off;

Figure 4 shows the transport container of Figures 1 and 2 when closed;

Figure 5 shows schematically the transport  
35 container of Figure 4 in use for discharge of powder material to another production vessel and

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Figure 6 shows part B of the system of Figure 5 to an enlarged scale.

Figures 1 and 2 show a disposable transport container 10 which comprises a narrow neck 12 to the mouth of which is attached a two part high containment transfer port consisting of a frame 14 in which is seated a door 16. Because it is to be disposable, the container 10 may be formed of a relatively inexpensive impervious material such as that commonly used for bagging bulk chemicals in powder form. The neck of the disposable container can either be formed from the outset as part of the container or can be a separate element fused to the container. If the container is a simple sack, the neck and a conical shoulder portion 13 can be an integral element to which a bag is secured, for example by welding. Alternatively, the mouth of the bag may be drawn together around a simple cylindrical neck and thereto the transfer part is attached by welding or clamping to the mouth region of the neck and itself be formed of plastics material thereby yielding a totally disposable container 10 which will be a low cost product which can be disposed of in an incinerator.

Figures 1 and 2 show the transport container attached to a discharge port of a production vessel 2 and powder 3 being transferred from the production vessel 2 to the transport unit 10 along a line of travel indicated by arrowed line 4 but with unavoidable contamination of the next at region 5. An initially empty transport container 10 is sealingly engaged via the frame 14 and door 16 to a compatible frame 18 and door 20 at the bottom of the production vessel. The frames 14 and 18 and the doors 16 and 20 together form a docking arrangement between transport container and production vessel. The manner in which this docking takes place to enable the faces of door 16 and door 20

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which are normally exposed to the environment to be sealed together and to enable frame 14 and 18 to lock together to secure the unit 10, thus eliminating environmental exposure, will be explained in greater detail with reference to Figures 3a and 3b.

Thus, Figures 3a and 3b show, attached to a wall 300 of a discharge chamber at the foot of the production vessel, frame 18 carrying at a hinge 312 a bar 311 formed at its distal end with a clasp 313 engaged by a latch assembly 314 pivotally mounted on the frame of the container neck. The bar 311 carries a bracket 315 to which is attached the door 20 which is a male door. The male door has a peripheral surface, shown here at 316, which is conical, reducing in diameter towards its forward end and matching a like shaped internal surface 317 of the frame 18. At its front surface, the door is provided with a plurality of holding cams 318 arranged around a circle at intervals and able to enter arcuate channels 418 in the door 16, a female door, belonging to the docking unit of the transport container made up of frame 14 and door 16. This enables the doors to engage/disengage through appropriate rotation of the transport container relative to the production vessel. An intimate engagement between the doors is achieved and ingress of material from the production vessel between the doors to contaminate their external surfaces is prevented by corner seals 319 and 419 carried by the respective doors.

The frame secured around the mouth of the neck 12 of the transport container provides a conically narrowing opening in which the female door 16 as a closure to the transport container rotationally engages by means of holding cams 420 spaced at intervals in circular formation on door 16 able to enter arcuate channels 420 in frame 14. In general, it is arbitrary

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which elements of a pair of associated elements has holding cams and which has arcuate grooves provided that coupling and uncoupling of elements can take place as required.

5        Having now described the fixed and displaceable portions of the docking arrangement for communicating production vessel 2 and transport container 10, the actions necessary to couple transport container 10 to the production vessel 2 and remove from the production  
10 vessel 2 into the transport container 10 powder material 3 will now be described.

      The transfer container 10 is brought to the area from which material is to be removed. Initially, both transport container and production vessel will be  
15 closed. Engagement is first effected between the frames 14 and 18 of the transport container and the production vessel respectively. Male/female location of the frames with respect to each other takes place and rotation through a predetermined angle engages the  
20 frames. At the same time, there will have been male/female location of the doors one within the other and a further rotation of the transfer container 10 with respect to the production vessel 2 engages the doors. If each rotation amounted to  $15^{\circ}$ , there will  
25 have been a total rotation of  $30^{\circ}$ . The male combination of doors will, at the same time, have been disengaged from the female frame 18 in which one of the doors, door 20, was previously held by holding cam/channel engagement, i.e. door 16 no longer locked  
30 in arcuate channels 420. The hinge bar clasp 313 is now unlatched, opened and the doors which form a physical barrier between the transfer container and the production vessel are rotationally displaced on the bar 311 allowing the direct access from the interior of the  
35 production vessel to the transfer container shown in Figures 1 and 2. Manipulation of the latch is done



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using a remote controlled lever arrangement (not shown).

When transfer of material into the transport container has been completed, the hinged bar 311 carrying the male and female door combination is relocated and locking clasp 313 and latch assembly 314 are engaged. The transport container 10 is rotated into the opposite direction to that previously. The first 15° rotation disengages the doors and a further 15° rotation disengages the frames. The transport container, closed by its door, is removed from the vicinity of the production vessel 2 over a controlled environment shown generally at 4 in Figure 1. The condition of the closure on the transport container 10 is now as shown in Figure 4 where the transport container is shown to be filled with powder material 3. The transport container can now be taken either to incineration as such or transferred to another location at which the powder material is to be used. Figures 5 and 6 illustrate the transfer of material from the transport container 10 to a further production vessel 2'. In order to charge the production vessel 2', the full unit 10 is inverted and sealingly engaged via frame 14 and door 16 to a compatible frame 18' and door 20' on the top of the production vessel 2'. Figures 5 and 6 effectively show a reverse arrangement of features to those shown in Figures 1 and 2 and the detailed description with respect to the coupling of transport container to production vessel does not need to be repeated here. It is sufficient to state that escape of powder to the environment during the transfer will be prevented by the sealing together of the doors and eventually a closed transport container will be obtained which will contain residual amounts of powder contamination on its interior surface, none having reached the environment. The container in this form

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may be reutilised in a repeat transfer operation for the same chemical product. More commonly, it will be disposed of as by supply to an incinerator so that the residual powder material therein at no stage can become an environmental hazard.

Should it be required to convert the production vessel 2 of Figures 1 and 2 to a different use, then cleaning thereof can be carried out by any convenient method which will remove residual powder material therein, such as suction or use of a solvent and at an appropriate stage in the cleaning operation, a transport container 10 will be attached to the production vessel in the manner already described in detail with reference to Figures 1 to 3b. The waste material from the production unit will then be passed into the transport container 10. When the transport container is separated from the production vessel, it can be supplied immediately to an incinerator. No encroachment of waste material on the environment will have taken place during the transfer.

While the invention has been described with particular reference to the removal of a powder product from a production vessel or storage vessel for transporting to a handling location at which the powder product can enter a further vessel for whatever treatment it is to be subjected to, the invention is not limited to such use. Any material able to be transferred from vessel to container for safe handling can be transported by the method of this invention, including closure elements to be decontaminated, "sharps" from medical practice to be disposed of and liquid products. The method can be used conveniently whether the contents of the vessel to be transported are known to need to be excluded from contact with the environment because of their toxicity or the like, because they are unsafe to handle or because of their

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potential as sources of danger requiring precautional  
safe handling measures.

**CLAIMS:**

1. A method of transporting contents of a vessel (2), such as a production vessel or storage vessel, to a handling location without exposing the contents to the environment, which comprises providing on the vessel an outlet port (18) having a first door (20) and bringing up to the port a transport container (10) for collecting material from said vessel and having an inlet port (14) provided with a second door (16), coupling the respective ports (14, 18) on the one hand and the respective doors (16, 20) on the other hand and displacing the coupled door combination thus produced so as to permit communication between transport container and said vessel and transferring said contents to the transport container, the surfaces of the doors which in the uncoupled state of the transport container (10) and said vessel (2) are exposed to the environment being sealingly engaged together to prevent ingress of material therebetween, and when transfer of contents into the transport container is to be terminated, closing off communication between said transport container (10) and said vessel (2) while at the same time disengaging said doors (16, 18) so as to leave the said ports closed by the respective said doors.

2. A method as claimed in claim 1, wherein the transport container (10) is a disposable container and, after disengagement of said doors (16, 18) has taken place, the disposable container with its inlet port attached thereto and said contents optionally remaining therein is supplied to an incinerator for destruction of container and any contents thereof.

3. The combination of an outlet port (18) attached or for attachment to a wall surface of a vessel (2), such as a production vessel or a storage vessel, and a transport container (10) having an inlet

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port (14) for engagement with said outlet port (18), a door (16, 20) comprised by each said port, first coupling means for coupling said ports and second coupling means (418, 420) for coupling said doors when there is coupling of the ports to form a combined door, means (31) for displacing the combined door, when said ports are coupled, to communicate the upstream side of one port (14) with the downstream side of the other port (18), and sealing means (419) on said doors to prevent ingress of material therebetween, which ports are closable by the respective doors thereof on uncoupling said doors (18, 20) and uncoupling said ports (14, 16).

4. The combination of claim 3, wherein the transport container is a disposable container (10) which comprises an optionally integral narrow neck (12) to the mouth of which is attached the inlet port (14) provided with said second door (18).

5. The combination of claim 4, wherein the disposable transport container is a sack (10) which is secured to a conical shoulder portion (13) surmounted by the narrow neck (12) to the mouth of which is attached the inlet port (14) provided with said second door (16).

6. The combination of claim 4, wherein the disposable container is a sack (10) whose mouth is drawn around the cylindrical neck element (12) at a position on the neck element remote from one end thereof, at which end the neck element (12) is surmounted by the inlet port (14) provided with said second door (18), the sack (10) being attached to the neck by welding or clamping.

7. The combination of any one of claims 3 to 6, wherein the transport container (10) is formed of injection moulded plastics material.

8. The combination of any one of claims 3 to 7,

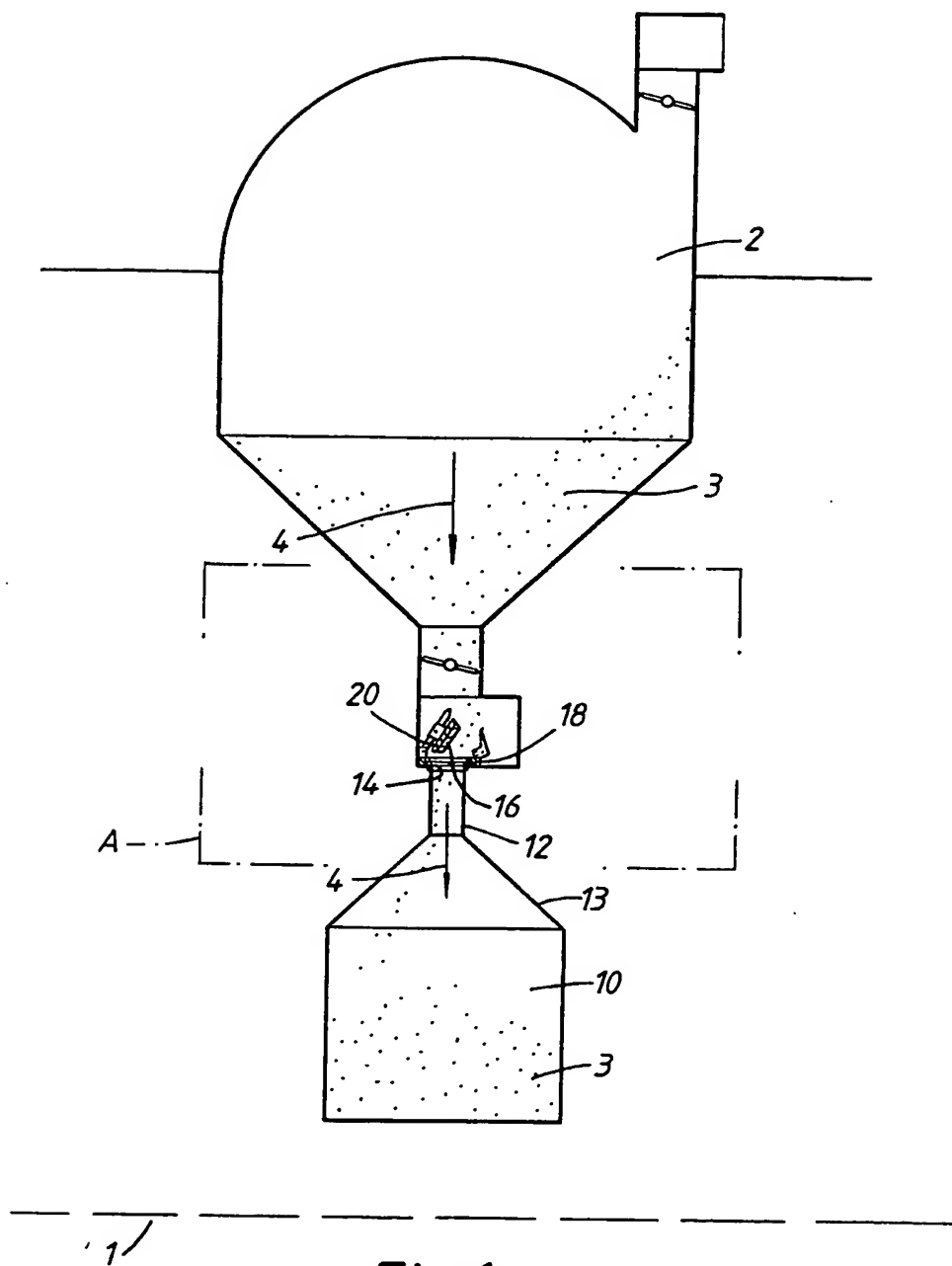
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wherein said ports are adapted for coupling by rotation of one with respect to the other.

9. The combination of any one of claims 3 to 8, wherein one said door (16, 20) and a mounting means on  
5 whichever of the vessel (2) or the transport container (10) the door is located on are adapted for rotational engagement, and the other said door is carried on a bar (311) hinged to the other of the powder containing  
10 adapted to constrain said other door to remain in a closed position.

10. The combination of any one of claims 3 to 9, wherein said doors (16, 18) are configured for male/female location of one within the other.

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SUBSTITUTE SHEET

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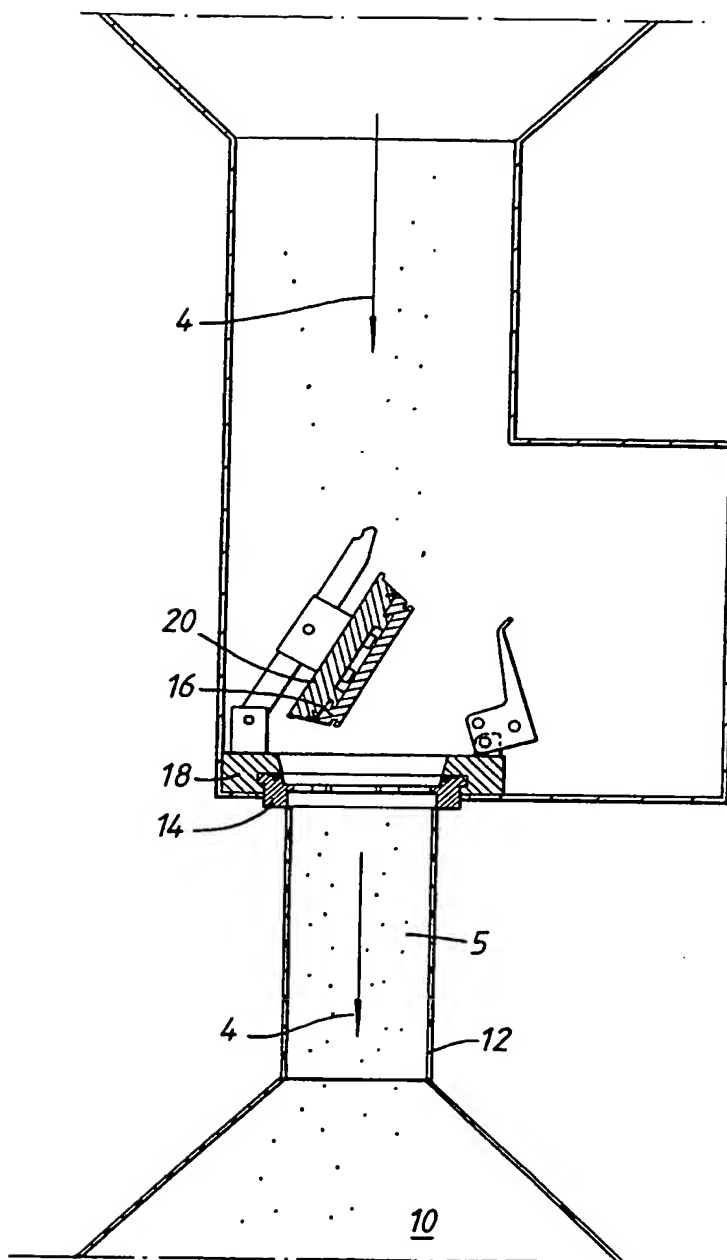


Fig. 2





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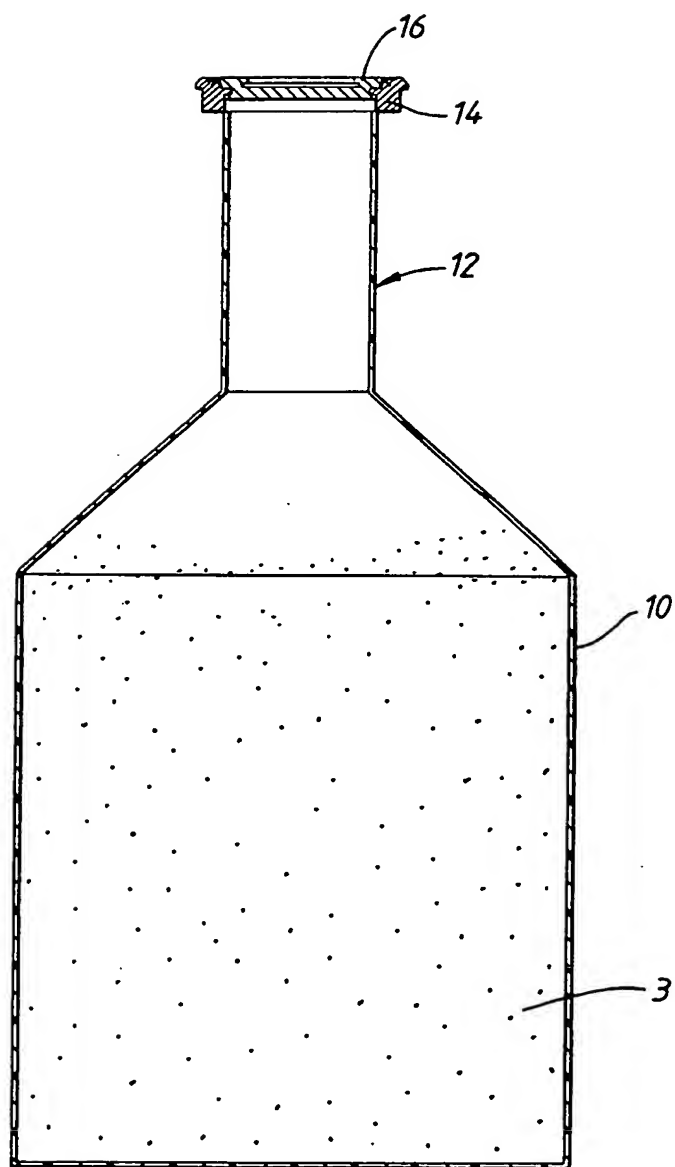
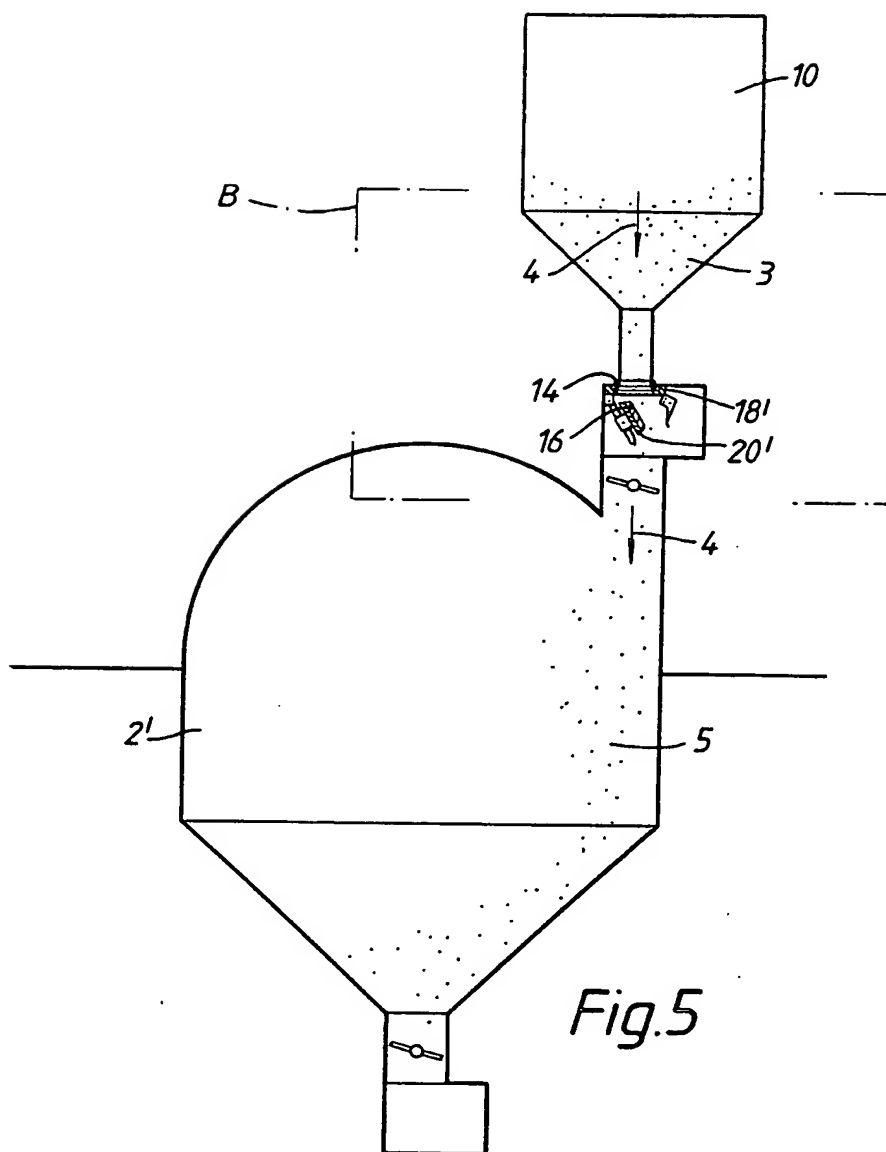


Fig.4

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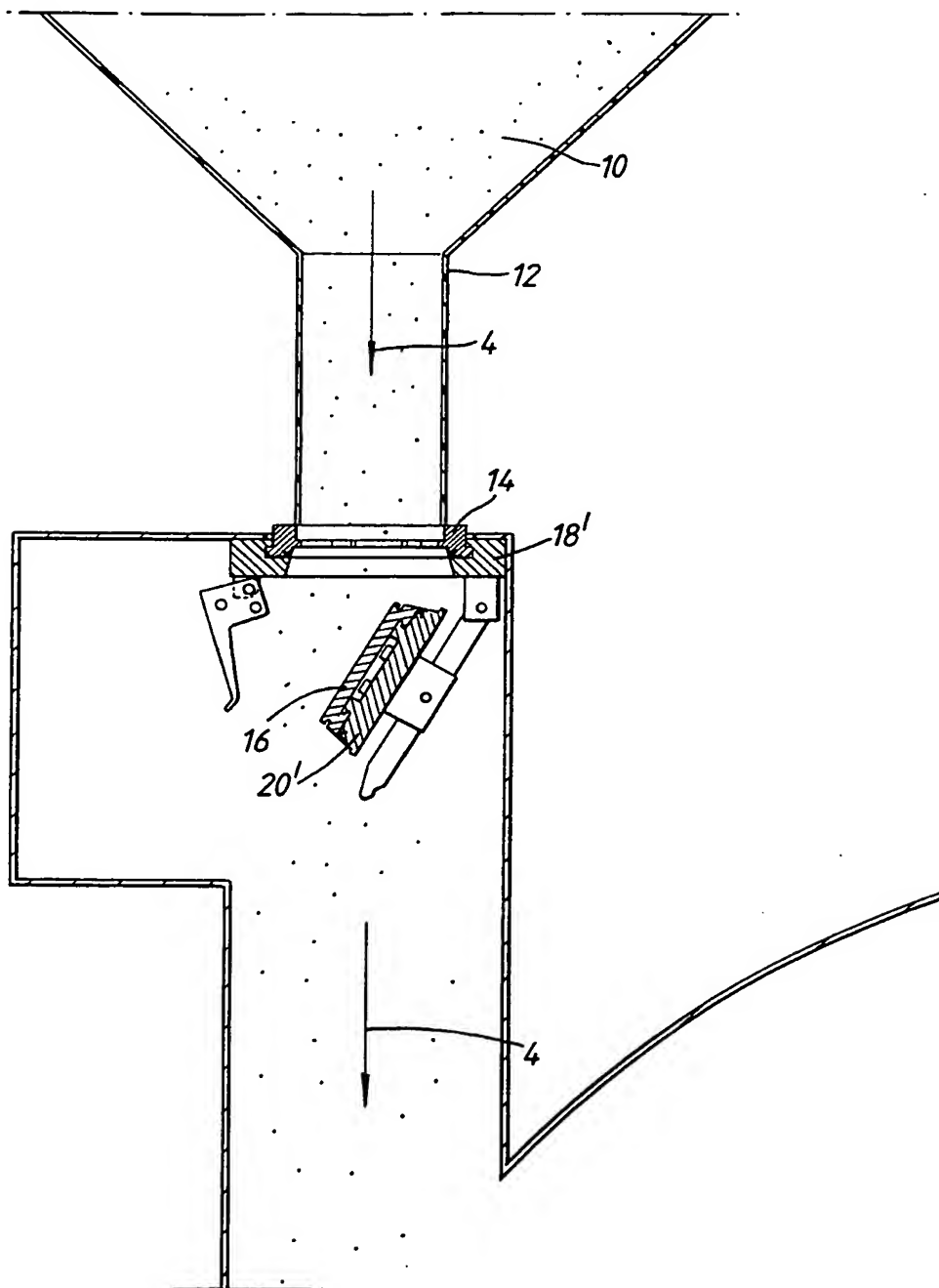


Fig.6

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## INTERNATIONAL SEARCH REPORT

International Application No.  
PCT/GB 93/02577A. CLASSIFICATION OF SUBJECT MATTER  
IPC 5 B65G69/18 B65B1/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 5 B65G B65B F23G B09B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A,2 640 598 (CONSTANTIN, COURTIN) 22 June 1990	1,3,10
Y	see abstract; figures ---	2,4,7
Y	EP,A,0 350 406 (KYOEI STEEL) 10 January 1990 see example 1	2,4,7
A	EP,A,0 380 255 (MATCON) 1 August 1990 see abstract; figures -----	1



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents :

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		JP-B- 4013031	06-03-92
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